we achieved what we set out to do, have the consequences of treatment been worth the outcome and is this economically viable. The collection of relevant data and its intelligent use is critical. Data that allows measurement of the impact of side effects of treatments both short and long term along a patients entire continuum of care, their global quality of life, the economic impact across the board and whether outcomes have influenced practice, and policy are all important. Knowing how cancer and treatment affect individuals is critical in trying to determine whether any intervention is effective, tolerable and acceptable. The Cancer Outcomes Measurement Working Group (COMWG) has provided a more inclusive method of global assessment[3]. This Group describes current best practices and recommendations for assessing the following three outcomes across the continuum of care: health-related quality of life; economic burden; and patient satisfaction;

The Radiation Oncology community has developed a scoring system for recording Common Toxicity Criteria both for acute and long term symptoms and collection of quality of life data in radiation oncology clinical trials is becoming routine[4]. A number of radiation oncology and medical oncology trials groups have consumers involved in the development of trials and on the trial management committees along with experts in quality of life.

For Interventional Oncology, having access to alarge and relevant data repository that allows for such global evaluation iscritical. Expanding data collection beyond the RECIST criteria to encompass themore global measures discussed above needs to become routine if interventional oncology treatments are to become incorporated into mainstream care, funded andvalued.

1. Breakaway: The global burden of cancer—challenges and opportunities. Economist Intelligence Unit Ltd 2009
2. www.RECIST.com
3. *outcomes.cancer.gov/areas/assessment/comwg.html*
4. *ctep.cancer.gov/reporting/ctc.html*

POSTER DISCUSSION: 9: CLINICAL: BREAST

PD-0315

High precision of MRI-guided target volume delineation before breast-conserving surgery.

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Purpose/Objective: MRI has a high sensitivity for tumor detection and a good correlation with histopathology findings. The precision of preoperative target volume delineation on newly developed 3D supine CE-MRI was compared to preoperative delineation on CE-CT in patients treated with breast-conserving therapy.

Materials and Methods: We tested a newly developed 3D high resolution MRI protocol for target volume delineation in RT supine position in 14 cT1-2N0 patients. Gross tumor volumes (GTVs) were delineated by 4 experienced breast radiation oncologists, following written delineation instructions, on preoperative contrast-enhanced (CE) CT (1x1 mm^2 in plane resolution, 3 mm slice thickness) and 3D CE-MRI (voxel size 1.2x1.2x1.2 mm^3). To assess whether differences in GTV delineation were also clinically relevant, clinical target volumes (CTVs) were created by addition of a 1.5 cm margin around the tumor volume excluding the skin and chest wall. Interobserver variability (IOV) was assessed by calculating the conformity index (CI) and the center of mass distance (dCOM) for both the GTV and CTV in each patient. Tumor characteristics on CE-CT and CE-MRI were assessed and scored by an experienced breast radiologist.

Results: In figure 1, target volume delineations of the 4 observers are shown on both preoperative CE-CT and CE-MRI in the same patient.

The median CI of the GTV was higher on CE-MRI compared to CE-CT (Table 1). After expansion to the CTV, this difference in CI was no longer statistically significant. However, an incorrect GTV was delineated on CE-CT in 2/14 patients (14%) by multiple observers (1/4 and 3/4 observers in each misdelineated patient). This resulted in high ranges of the CI on CE-CT.

Tumor shapes were rated as more irregular and spiculated on CE-MRI. This did not result in a decreased CI on CE-MRI. A uniform volume expansion of GTV to CTV resulted in larger volumes on CE-MRI compared to CE-CT.

No difference in median dCOM was observed between both image modalities.

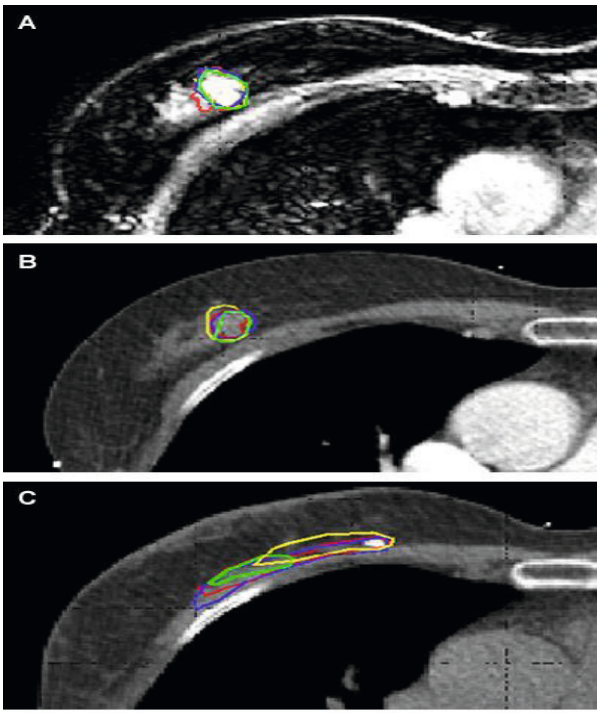

Figure 1 3D GTV delineations of 4 different observers in one patient in the transverse plane at (a) preoperative CE-MRI, (b) preoperative CE-CT, and (c) a clinical example of a postoperative CT.

Table 1 Parameters of interobserver variability (n=14)

	CT		MRI		
	Median	Range	Median	Range	p-value
Mean volume (cm^3)					
GTV	2.9	0.5 – 14.9	2.6	0.7 – 17.0	0.47
CTV	54.0	30.3 – 112.8	60.9	34.5 – 129.4	0.02
Conformity index					
GTV	0.52	0.24 – 0.67	0.60	0.48 – 0.74	<0.01
CTV	0.81	0.38 – 0.85	0.82	0.77 – 0.87	0.11
Mean dCOM (mm)					
GTV	1.5	0.6 – 39.6	1.2	0.5 – 2.3	0.08
CTV	1.7	1.1 – 39.4	1.7	0.8 – 3.4	0.60

CI Conformity Index, GTV gross tumor volume, CTV clinical target volume, dCOM center of mass distance. Mean volume and dCOM were calculated per patient, median values were calculated over the included patient population.

Conclusions: Preoperative target volume delineation showed a higher precision on 3D CE-MRI compared to CE-CT. A more irregular and spiculated tumor was visualized on CE-MRI without a decrease of interobserver agreement. Future studies will focus on using preoperative CE-MRI guided delineation in preoperative, as well as additional information in postoperative, whole or accelerated partial breast irradiation.

PD-0316

Forward planned intensity modulated whole breast hypofractionated radiotherapy: results in 500 patients

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Purpose/Objective: START A and START B studies have demonstrated a similar toxicity obtained by hypofractionation and standard fractionation in whole breast adjuvant radiotherapy. The aim of this study is the evaluation of hypofractionation effect on toxicity in our breast cancer patients.

Materials and Methods: From 02/2009 to 01/2012 500 patients were treated with hypofractionated whole breast radiotherapy, 40 Gy/15 fractions, delivered in 3 weeks, in our institution. Five patients had bilateral treatment. The median patient age was 62 yrs(28-91yrs).

A median number of 4 segments was used (2-12) within a tangential two field irradiation technique. 357 (70,69%) of breasts needed ≥4 segments to obtain a homogeneous dose. To report the acute toxicity (6 months follow up included), the RTOG/EORTC scale was used, while for late toxicity the SOMA LENT scale was used.
Results: The median follow-up of this group of patients was 11 mts(1-37 mts). One patient was dead at the last follow up, with distant metastases and 7 presented progressive disease: 5 distant, 1 local and 1 infrapectoral.
The toxicities were:

Toxicity grade	End of RT (505 pts)	At 6 mts (420 pts)	At 12 mts (232 pts)	At ≥24 mts (54 pts)
G0	119	327	203	52
G1	327	92	28	2
G2	55	1	1	1
G3	4	0	0	0

Twenty-one of 505 pts(4,16%) presented a delayed acute toxicity, 5-30 days after the end of radiotherapy.
Toxicity was intended as skin discoloration, oedema and fibrosis. No lung or heart toxicity were recorded.
Conclusions: The hypofractionated FIMRT regimen (2,67 Gy/fr) used for WBRT in our institution allowed us to obtain a good acute and late toxicity, better than historical standard fractionation results, with no treatment interruptions.

PD-0317
Field-based and volume-based PTV as plan evaluation structures in the UK FAST-Forward breast trial
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Purpose/Objective: The FAST-Forward trial is a multicentre phase III trial comparing a 1-week course of curative breast radiotherapy (RT) against a standard 3-week schedule (ISRCTN19906132). The purpose of this study was to assess the applicability of field-based (FB) and volume based (VB) PTV for dosimetric data analysis and to evaluate the consistency of the results reported using them.
Materials and Methods: The ongoing QA programme for the FAST-Forward trial involves retrospective individual case reviews to be carried out and for the completion of a number of dose objectives reported for the treated breast volume and organs at risk. Depending upon the centre's preference, both field-based (FB) and volume-based (VB) PTVs were accepted as plan evaluation structures.
As very few centres routinely contour breast CTV and PTV, centres were instructed in the trial protocol to generate a field-based PTV, defined 5 mm from the skin, 5 mm from the lung / chest wall interface, 5 mm from the posterior beam and 10 mm from the superior and inferior beam edges.
The trial protocol stipulated that the dose distribution across the selected dose reporting volume should be within the ICRU guidelines of -5% to +7%, with a coverage limit of V95% ≥ 95% and high dose limits of V105% ≤ 5% and V107% ≤ 2%.
Each retrospective individual case review was assessed on this basis.
Results: To date 338 plans have been collected from 9 RT centres. Eight of these used a FB planning approach and only one contoured a CTV and PTV.
Based on plan reviews and centre feedback the following differences between the two structures can be summarised:
- The FB approach resulted in a 5% to 50% larger reporting volume which often included non-breast tissue, especially in the superior end of the volume. Planners reported difficulties achieving 95% coverage in the superior end.
- The VB approach produced a structure that was anatomically relevant but extended further towards the sternum and often the medial part of the VB PTV had to be excluded from the fields.
Initial analysis of 15 plans from the centre using VB planning indicated that:
- The reported target coverage was worse for the FB PTV than for the VB PTV, which means that some plans were rejected as suboptimal based on a FB PTV that would otherwise have been accepted.
- VB plans would sometimes have 105% hotspots outside the VB PTV, which would not be reflected in the DVH. The reported V105% was equally likely to be increased or decreased when moving to a FB PTV.
- It was noted that the centre using the VB technique exhibited on average a higher lung V30% dose and had a greater number of percentage deviations for the lung objective.
Conclusions: The analysis of the data collected so far shows that both FB and VB PTVs can be used as breast plan evaluation structures providing the discrepancies we have discovered are considered.
Further planned work includes extending the sample of VB plans and adding data from more centres using the VB approach. A CTV will be contoured for an additional sample of FB plans in order to further analyse the effect of the planning approach on the amount of lung included in the treatment fields.

PD-0318
Comparison of four proposed prognostic indexes in breast cancer patients with brain metastasis
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Purpose/Objective: Several prognostic scores had been proposed in the literature to predict patient survival for brain metastasis from breast cancer. However, which score is most appropriate for these patients are still unknown. The aim of the study was to compare the four prognostic indexes predicting survival: the Recursive Partition Analysis (RPA), the Basic Score for Brain Metastasis (BSBM), the Breast-Cancer-Specific GPA (BC-GPA) and the breast cancer RPA (BC-RPA) (Table 1).
Materials and Methods: Eighty-seven patients (median age 48) with brain metastasis from breast cancer were evaluated. All patients treated with WBRT with or without surgery, radiosurgery and systemic therapy between January 2000 and December 2011. Survival time was measured from the time of first treatment of BM to the date of death or last follow-up. Survival curves were calculated by using Kaplan-Meir method. To identify clinical factors associated with survival time, Cox proportional hazard model was used.

Table 1: The Recursive Partition Analysis, the Basic Score for Brain Metastasis, Breast-Cancer-Specific GPA and breast cancer RPA

Prognostic indexes	
RPA	
Class I	Age <65 y, KPS ≥ 70, controlled primary tumor, no extracranial metastasis
Class II	All patients not in Class I or III metastases
Class III	KPS < 70
BSBM	Score
	0 1
KPS	50-70 80-100
Control of primary tumor	No Yes
Extracranial metastases	Yes No
BC-GPA	Score
	0 0.5 1 1.5 2
KPS	≤50 60 70-80 90-100 -
Genetic subtype	Basal - Luminal A Her-2 Luminal-B
Age	≥60<60 - - -
BC-RPA	
Class I	1–2 brain metastases and extracranial disease absent or controlled and KPS 100
Class II	All others
Class III	Multiple brain metastases and KPS≤60

Abbreviation: RPA= Recursive partitioning analysis, BSBM=Basic Score for Brain Metastases, BC-GPA= Breast Cancer Specific Graded Prognostic Assessment, BC-RPA=New Breast Cancer Recursive Partitioning Analysis, KPS = Karnofsky Performance Status

Results: Median survival time (MST) for all patients was 8 months. MST of patients in the RPA classes I, II, III were 12, 8.3 and 3.4 months, respectively (p=0.001). MST of patients in the BC-RPA class I was undetectably longer than that of the patients in BC-RPA class II (8 months) and class III (3.4 months) (p=<0.0001). According to the BSBM scoring system, MST of patients with score 0,1,2 and 3 were 2, 5.5, 8.3 and 26.5 months (p=0.051), respectively. According to the BC-GPA scoring system, MST of patients with scores ranging 0.5-1, 1.5-2, 2.5-3 and 3.5-4 were 3.4, 5.5, 8 and 20 months (p=0.001), respectively. Although the pairwise comparison of adjacent groups was found significant for RPA index[subclass I vs. II (p=0.041), subclass II vs. III (p=0.016)] and BC-RPAindex [subclass I vs. II (p=0.004), subclass II vs. III (p=0.003)], there were no survival differences between some pairs of groups for BSBM index [subgroup 0 vs. 1 (p=0.435), subgroup 1 vs. 2 (p=0.178), subgroup 2 vs. 3 (p=0.042)] and BC-GPA index [subgroup 0.5-1 vs. 1.5-2 (p=0.947), subgroup 1.5-2 vs. 2.5-3 (p=0.144), subgroup 2.5-3 vs. 3.5-4 (p=0.144)] indexes. Regarding the prognostic factors in our population, only the BC-RPA prognostic index was found independent predictor on survival (HR=5.11, p=0.01) within other indexes.
Conclusions: In the present study, we compared four proposed prognostic indexes which of two, the BC-GPA and BC-RPA, were new. We validated the utility of RPA and BC-RPA prognostic indexesfor breast cancer patients with brain metastasis. A new index, BC-RPA was found more prognostic compared to other indexes. Further assessing of the BC-RPA in future trials and direct comparison of the indexes in studies with large number of patients answer the question,